

Telecon Notes for October 17, 2002

Participants

Jonathan Bernays (MIT LL)

Bob Grappel (MIT LL)

Ann Drum (MIT LL)

Dave Spencer (MIT LL)

Jim Maynard (UPS-AT)

Tom Foster (Self for FAA)

Bill Morris (Raytheon)

Joel Wichgers (Rockwell Collins)

Steve Koczko (Rockwell Collins)

Others

Agenda –Discussion / Review of Enhanced Visual Acquisition

We reviewed the feedback that WG4 provided to Bob Grappel et. al. on the EVAcq application at the Oct 11, 2002 Telecon. We went over the list of comments and addressed them one at a time:

Horizontal position (normal versus degraded information), size of error

Position error was discussed. “Age of Data” requirement is bounded to 12 seconds, twice the requirement for latency (which was 6 seconds).

Position error is a function of ‘range for the application’ and the ‘age of data’. Jonathan B. commented that the ‘age of data’ requirement is tied to position surveillance and that it is the responsibility of the display system to manage / determine the entire application error bound.

Traffic passing underneath is typical. At close range, one will not be able to determine the bearing (position errors are too large to determine bearing). Show traffic as degraded, i.e., “on top off” own ship in such cases.

Jonathan B. - The error bound of a report as determined by the relative range and relative bearing is the responsibility of the display system.

“Velocity Issue”

LL analysis suggests that velocity shall not be used. They do not foresee a requirement for velocity, in fact they do not want it to be used in updating position. This was a point of discussion by the group. The group took the position that velocity (when available,

which it is for ADS-B) should be used when extrapolating position data. LL (Jonathan B.) took the position that “surveillance” is strictly concerned with position measurement, which is what is displayed on the CDTI. LL foresees no requirement to synchronize / time align all traffic targets. LL suggests updating targets when position updates occur (analogous to controller displays).

Jonathan B. noted that some surveillance sources do not provide velocity information (e.g., TIS-B). It was also noted that there is no NIC_v value currently defined that provides a bound (and integrity) on velocity. Should velocity not be used in updating position data due to the lack of NIC_v ? The impact of velocity integrity failure is not currently included in the safety study. Tom Foster suggested that the use of the 95% NAC_v mitigates this concern for some applications.

Concerning reference to the velocity requirement, LL took the action to make the following text edits: “Remove text that states “shall not use velocity”. Add a guidance paragraph on why/how velocity can be used, including the use of velocity cross check.

Action: Dave will look at the fault tree to see if there is a mitigation to having a “completely/different” erroneous position on CDTI.

Synchronous / Time Aligned Update of Target Data for CDTI

The group wants all targets to be updated to the same time for display purposes. This view is not shared by LL. LL indicated that this is not how ATC radar displays are currently updated. Jonathan B raised a couple of questions:

- 1) Should we be displaying ‘Direct Measured Data’ versus ‘Extrapolated data’?
- 2) Should CDTI position match the actual data?

It was noted that several ASAS applications are likely to be running at one time. Suggests case for time alignment of traffic position information for use by application processing and for simultaneous update on the CDTI display.

SIL= 0

Dave used NIC to determine the maximum position uncertainty bound requirement for EVAcq. There was no NAC requirement derived. The group agreed that NAC is always \leq NIC, thus in lieu of a derived NAC requirement, one could set NAC to the NIC required value.

Question was raised: What do we do if we get good NAC, but a bad / large NIC?

Dave: NIC requirement comes from Safety Analysis. The primary safety / hazard concern is “misdirecting the flight crew with erroneous CDTI position depiction”.

EVAcq requirements indicate a requirement for a $SIL=0.01$ for both traffic targets, and for ownship. Since SIL’s are defined as 0, 10-3, 10-5 and 10-7 in the ADS-B MASPS, a $SIL=0$, i.e., no integrity indication by the traffic, requires that the traffic must be displayed as degraded. In addition, if ownship has a $SIL=0$, all traffic received must be shown as degraded.

Discussion Item: What if SIL = 0, can we use NAC instead to deal with NIC/SIL being of inadequate integrity? Current TSO C-139 (?) do not output SIL, HPL/NIC. Can we infer a SIL for this equipment?

“Maximum delay to integrity changes” requirement

“Maximum delay to indicate integrity changes” remains at 6 seconds. However, this delay is on top of the time to alert of the navigation system. Jonathan B took the action to reinterpret this parameter and to take an end-to-end look at this parameter.

Accuracy Requirement

LL analysis considered maximum uncertainty error, NIC, and does not provide a NAC. Set NAC = NIC as a requirements???

Report Time Accuracy

1 sec is the proposed requirement.

Workload

LL will make the edit to correct the inadvertent wording concerning workload.

600 kts closure rate

Visual cannot deal with 1200 kts closure and can only deal with 600 kts closure rates; can see 5 miles, which represents 30 seconds (similar to TCAS) at the 600 kts closure rate. (run this by Bob Hilb). LL Action: Add a comment that 600 kts closure represents what can be dealt with visually (already in document on page 13, 2nd paragraph). Will add a note.

AC Density Requirements

Display at least 10 aircraft. If greater than 10 aircraft are present, take those that are closer. Filtering criteria: range, range rate & altitude. Tom – keep in mind the limits to visual range, (forward view, or lights at night). Bob G also indicated that one may maneuver the aircraft to see traffic that is behind.

Integrity for Subsystems

Steve noted the importance and need to allocate integrity requirements to the various ASA subsystems. This actually pertains also to other nominal performance parameters that need to be allocated to subsystems.

6 second update rate

Bob G indicated that for this update rate, at 600 kts closure rate, this equals to 1 NM distance. (Coverage volume is 10 NM)

“Horizontal Position Accuracy and Integrity” Requirement

Referring to the table on Page 15, the requirement for “horizontal position accuracy and integrity” was discussed. Two states of degraded data were identified in the table. After a considerable amount of discussion, it was decided that these could be merged into a single requirement: When a) the sum of the horizontal containment bounds of ownship and the traffic’s position is greater than 0.25 times the calculated range, or b) the SIL of either aircraft’s NIC is greater than 0.01, then an indication shall be provided to the flight crew in association with the traffic information or position symbol for any displayed traffic.

Note: Since SIL’s are defined as 0, 10⁻³, 10⁻⁵ and 10⁻⁷ in the ADS-B MASPS, a SIL=0, i.e., no integrity indication by the traffic, requires that the traffic must be displayed as degraded. In addition, if ownship has a SIL=0, all traffic received must be shown as degraded.

This is a discussion point for WG4 and WG1.

Discussion of what is the threshold for when a relative bearing is uncertain? LL has been using +/- 15 degrees as the requirement.

Action: Jonathan B. noted that they need to also address relative range error in their analysis (e.g., 1/8 mile versus 1 mile error).

Degraded indication for displayed traffic, e.g., “Aircraft on Top”

The LL analysis considered 2 cases of degraded information. These were later merged into one category of degradedness. When bearing error bounds become excessive, particularly for close range, the traffic position becomes indeterminate, and one can only indicated its presence, without a bearing position, “aircraft on top”.